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Inventors(s): Kobayashi et al.

Group Art:

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Examiner:

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VERIFIED TRANSLATION OF PRIORITY DOCUMENT

The undersigned, of the below address, hereby certifies that he/she well knows both the English and Japanese languages, and that the attached is an accurate translation into the English language of the Certified Copy, filed for this application under 35 U.S.C. Section 119 and/or 365, of:

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JAPAN PATENT OFFICE

This is to certify that the annexed is a true copy of the following application as filed with this Office.

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Applicant(s): DENSO CORPORATION

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[Name of Article]	Drawings	1
[Name of Article]	Abstract	1
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[Type of Document] Specification

[Title of the Invention] Electronic Control Unit

[Claims]

[Claim 1] An electronic control unit, having a case wherein at least a bottom surface opens, and an approximately plate-shaped cover which closes a case opening in a state where a circuit board is contained in the case,

wherein a stay projecting from a side surface of said case is integrally formed with said cover, and a first rib is formed in approximately the same direction as that in which said stay extends.

[Claim 2] The electronic control unit according to claim 1, wherein a first rib is provided so as to extend from outside to inside of said case, and wherein in said case, a concave portion or convex portion corresponding to a rib shape is formed in a position to abut said first rib.

[Claim 3] The electronic control unit according to claim 1 or 2, wherein in said cover, a second rib is formed in the bottom plate positioned in the case.

[Claim 4] The electronic control unit according to claim 3, wherein said second rib has a convex shape projecting to the inside of the case, and is provided on the periphery of the circuit board.

[Detailed Description of the Invention]

[0001]

[Technical Field of the Invention]

The present invention relates to an electronic control unit mounted on an automotive vehicle, and more particularly, to a casing structure for electronic control unit.

[0002]

[Prior Art]

An electronic control device such as an engine ECU (electronic control unit) is mounted in an automotive vehicle which perform various electronic controls, and in the electronic control unit, a circuit board is contained in accommodation space formed by case and cover. Further, the electronic control unit is attached to the automotive vehicle by using a bracket. In this case, a stay is integrally formed with the cover, and the stay itself is used as a bracket, otherwise, another bracket member is attached to the stay after the electronic control unit has been assembled.

[0003]

Fig. 4 is an exploded perspective view for explanation of conventional structure of the electronic control unit (ECU). As shown in Fig. 4, an ECU 50 has a case 51, a circuit board 52 and a cover 53, and the respective members are assembled by fastening by screws 54. The cover 53 is provided with stays 55 projecting outward from case side surfaces. The stays 55 have screw holes 56 in e.g. 2 positions. Then the ECU 50 is attached to the automotive vehicle via the stays 55. In this case, it may be determined whether the stay 55

itself is used as a bracket or another bracket member is used, based on a factor such as an attachment position on the vehicle side.

[0004]

[Problem to Be Solved by the Invention]

However, in the above ECU 50 in Fig. 4, a part of the cover 53 is merely extended into a plate shape as the stay 55. Accordingly, when the ECU 50 is mounted on a portion of automotive vehicle where a high level of vibration is caused, there is a possibility that stay 55 may be broken due to insufficiency of strength.

[0005]

The present invention has been made in view of the above problem, and has its object to provide an electronic control unit in which the strength of stay provided in the cover is improved.

[0006]

[Means to Solve the Problems]

In the electronic control unit described in claim 1, the stay projecting from the side surface of the case is integrally formed with the cover, and the first rib is formed in the stay of the cover in approximately the same direction as that in which the stay extends. By this arrangement, the strength of the stay is improved. Accordingly, when the ECU is mounted on an automotive vehicle where a high level of vibration is caused, the unit can be provided with sufficient vibration-resistance and distortion-resistance strength.

[0007]

Further, in the invention described in claim 2, the first rib is provided so as to extend from outside to inside of the case, and in the case, a concave portion or convex portion corresponding to a rib shape is formed in a position to abut the first rib. Accordingly, when the cover is attached to the case, positioning of these members can be easily and precisely made by putting the concave portion 25 and the first rib 36 together. Accordingly, the operability of attachment can be improved.

[0008]

Further, in the invention described in claim 3, in the cover, a second rib is formed in the bottom plate positioned in the case. In this case, the strength of even the bottom plate of the cover is improved.

[0009]

Further, in this case, it is preferable as described in claim 4 that the second rib has a convex shape projecting to the inside of the case, and is provided on the periphery of the circuit board. In this case, even if foreign particles or the like enter from outside to inside of the case via the stay, they can be stopped immediately front of the circuit board by the second rib. Accordingly, further effect of prevention of problems such as short circuit in the circuit board can be attained.

[0010]

[Working Examples]

Hereinbelow, a working example embodying the present invention will be described with reference to the drawings. Fig. 1 is a perspective view showing the entire structure of ECU 10. Fig. 2 is an exploded perspective view showing principal constituents of the ECU 10 in an exploded manner.

[0011]

In these Figs. 1 and 2, the ECU 10 has a case 11 in which a bottom surface opens, a circuit board 13 with which a connector 12 is integrated, and an approximately plate-shaped cover 14 to close the opening of the case 11, and these respective members are assembled by fastening by screws 15. For example, the case 11 and the cover 14 are formed by press working using an iron plate, an aluminum plate or the like. Note that in the present working example, the front/rear/up/down directions of the ECU 10 are defined based on the states in Figs. 1 and 2 for the sake of convenience, and in the case 11, the side where a connector 12 is exposed is a front surface, and its opposite side is a rear surface.

[0012]

Next, the constructions of the case 11 and the cover 14 will be described in detail. First, in the case 11, a connector exposure portion 21a is provided on one side surface, and sidewalls 21b, 21c and 21d are provided on the other three side surfaces. Among the sidewalls 21b to 21d, the left and right sidewalls 21b and 21c are

tapered and the rear sidewall 21d is provided upright. A flat pedestal 22 surrounding the case opening is provided below the sidewalls 21b to 21d, and a fringe of the circuit board 13 is placed on the lower surface of the pedestal 22. Further, a guide member 23 slightly greater than the outer dimension of the circuit board 13 is provided on the periphery of the pedestal 22. Comparatively low and cylindrical nuts 24 are embedded in an upper surface of the pedestal 22 at the corners of the case 11.

[0013]

On the other hand, the cover 14 has approximately the same outer dimension as that of the circuit board 13, and has a bottom plate 31, a pedestal 32 provided on the periphery of the bottom plate 31. In this case, the flange of the circuit board 13 is placed on the pedestal 32. That is, when the ECU 10 is assembled, the circuit board 13 is fixed with its flange held between the pedestal 22 of the case 11 and the pedestal 32 of the cover 14.

[0014]

Further, a pair of stays 33 projecting outside from the case 11 are integrally formed with the cover 14, and the stays 33 are provided with mounting holes 34 for mounting a bracket (not shown). In this case, the ECU 10 is mounted on the automotive vehicle via the brackets attached to the stays 33. Note that since the bracket does not disturb conveyance and the specification of the

stay 33 can be unified regardless of various brackets for car models, there are merits of previously providing the stays 33 in the cover 14 and attaching another bracket later. Note that it may be arranged such that the stays 33 themselves are used as a bracket and the ECU 10 is directly mounted on the automotive vehicle by using the mounting holes 34.

[0015]

Further, the end of the stay 33 is bent thus a bent portion 35 is formed. However, in the ECU 10 of the present working example, whether the bent portion 35 is provided or not is not the subject matter, accordingly, an arrangement without the bent portion 35 may be employed.

[0016]

Further, in the cover 14, a first rib 36 is provided at the center of the stay 33, and a second rib 37 is provided on left and right edges of the bottom plate 31. The first rib 36 is provided in approximately the same direction as that in which the stay 33 extends, and the second rib 37 is provided so as to extend along the sidewalls 21b and 21c of the case 11. The first and second ribs 36 and 37 have an upwardly-convex semispherical or triangular cross section, and the respective ribs intersect at right angles at the center of the second rib 37.

[0017]

In this case, as the first rib 36 extends from the

outside to inside of the case 11, a concave portion 25 corresponding to the rib shape is provided in a position to abut the first rib 36. By this arrangement, when the cover 14 is attached in the case 11, positioning of these members can be easily and precisely made by putting the concave portion 25 and the first rib 36 together. Accordingly, the operability of attachment can be improved.

[0018]

Further, in a state where the cover 14 is attached to the case 11, the second rib 37 is positioned inside the case 11 as shown in Fig. 3. In this case, even if foreign particles or the like enter from outside to inside of the ECU via the stay 33, they can be stopped immediately front of the circuit board by the second rib 37. Especially, if conductive foreign particles can be removed, problems such as short circuit in the circuit board 13 can be prevented.

[0019]

According to the present working example as described above in detail, as the first rib 36 is formed in the stay 33 of the cover 14 and the second rib 37 is formed in the bottom plate 31, the strength of the entire cover including the stay 33 is improved. Accordingly, in a case where the ECU is mounted on an automotive vehicle or the like where a high level of vibration is caused, the unit can be provided with sufficient vibration-resistance and distortion-resistance strength.

[0020]

Further, in this case, as the strength of the stay 33 can be ensured by the first and second ribs 36 and 37, different from a case where the thickness of the stay 33 is increased, the effect of weight reduction can be attained. Further, as the first and second ribs 36 and 37 can be formed upon press forming the cover 14, the cost can be reduced.

[0021]

Note that the present invention can be embodied in the following example other than the above example.

In the above working example, the first rib 36 is formed in one position at the center of the stay 33 of the cover 14, however, it may be provided in two or more positions. Further, the first rib 36 has an upward convex shape, however, it may have a downward convex shape. In a case where the first rib 36 has a downward convex shape, a convex portion may be provided in correspondence with the rig shape in the case 11.

[0022]

In the above working example, the first and second ribs 36 and 37 are provided in the cover 14, however, it may be arranged such that only the first rib 36 is provided.

[Brief Explanation of the Drawings]

[Fig. 1] A perspective view showing the structure of the ECU in the working example of the present invention.

[Fig. 2] An exploded perspective view of the ECU.

[Fig. 3] A cross-sectional view showing the attachment status of the case and the cover.

[Fig. 4] An exploded perspective view showing the structure of the ECU in the conventional art.

[Explanation of Reference Numerals]

10 ... ECU (electronic control unit), 11 ... case, 13 ... circuit board, 14 ... cover, 33 ... stay, 35 ... bent portion, 36 ... first rib, 37 ... second rib.

[Type of Document] Abstract

[Abstract]

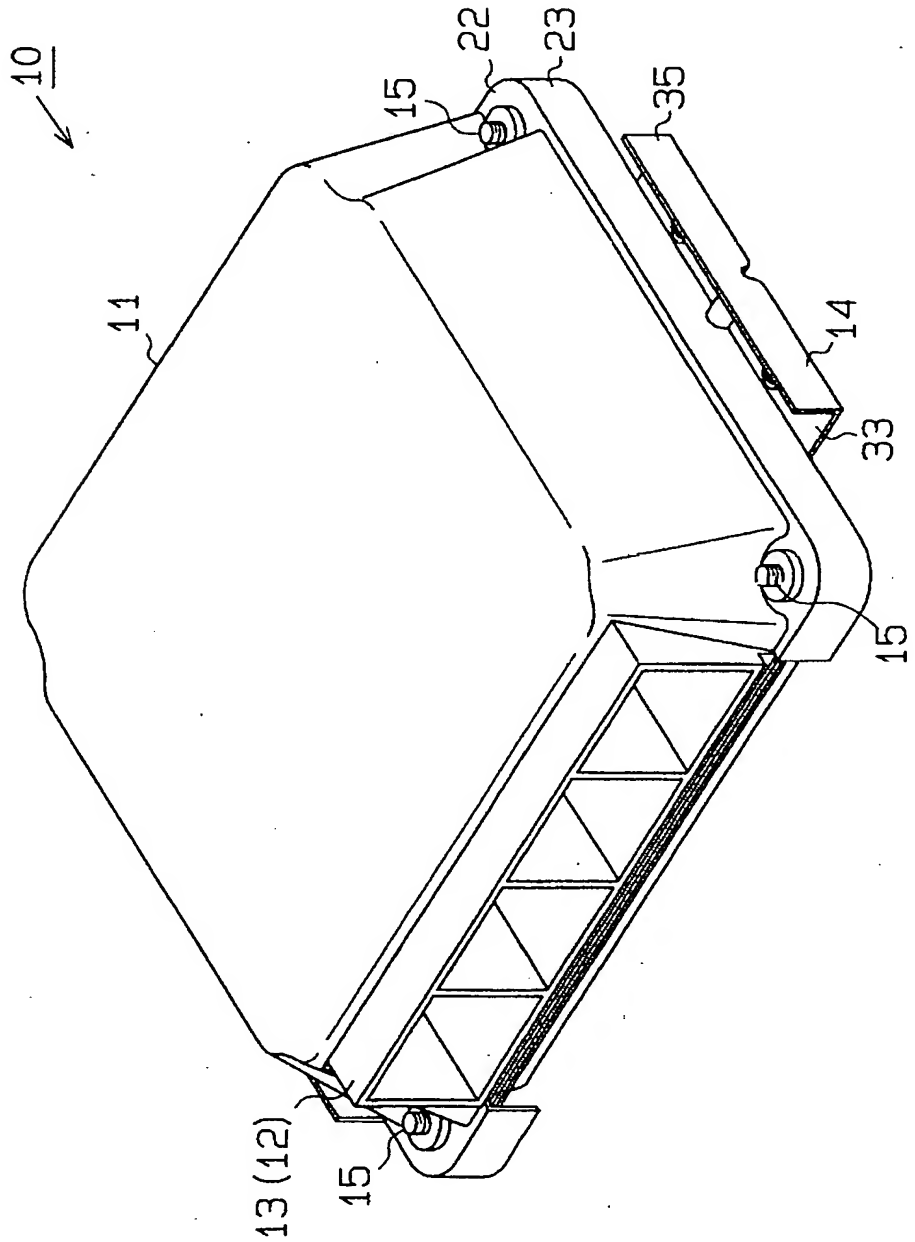
[Object] To improve the strength of stay provided in a cover.

[Means of Solution] An ECU 10 has a case 11 in which a bottom surface opens, a circuit board 13 with which a connector 12 is integrated, and an approximately plate-shaped cover 14 to close the opening of the case 11. A pair of stays 33 projecting outside from the case 11 are integrally formed with the cover 14. Further, in the cover 14, a first rib 36 is provided at the center of the stay 33 and a second rib 37 is provided on left and right edges of bottom plate 31. The first rib 36 is provided in approximately the same direction as that in which the stay 33 extends, and the second rib 37 is provided so as to extend along the sidewalls 21b and 21c of the case 11. The first and second ribs 36 and 37 have an upwardly-concave semispherical or triangular cross section, and the respective ribs intersect at right angles at the center of the second rib 37.

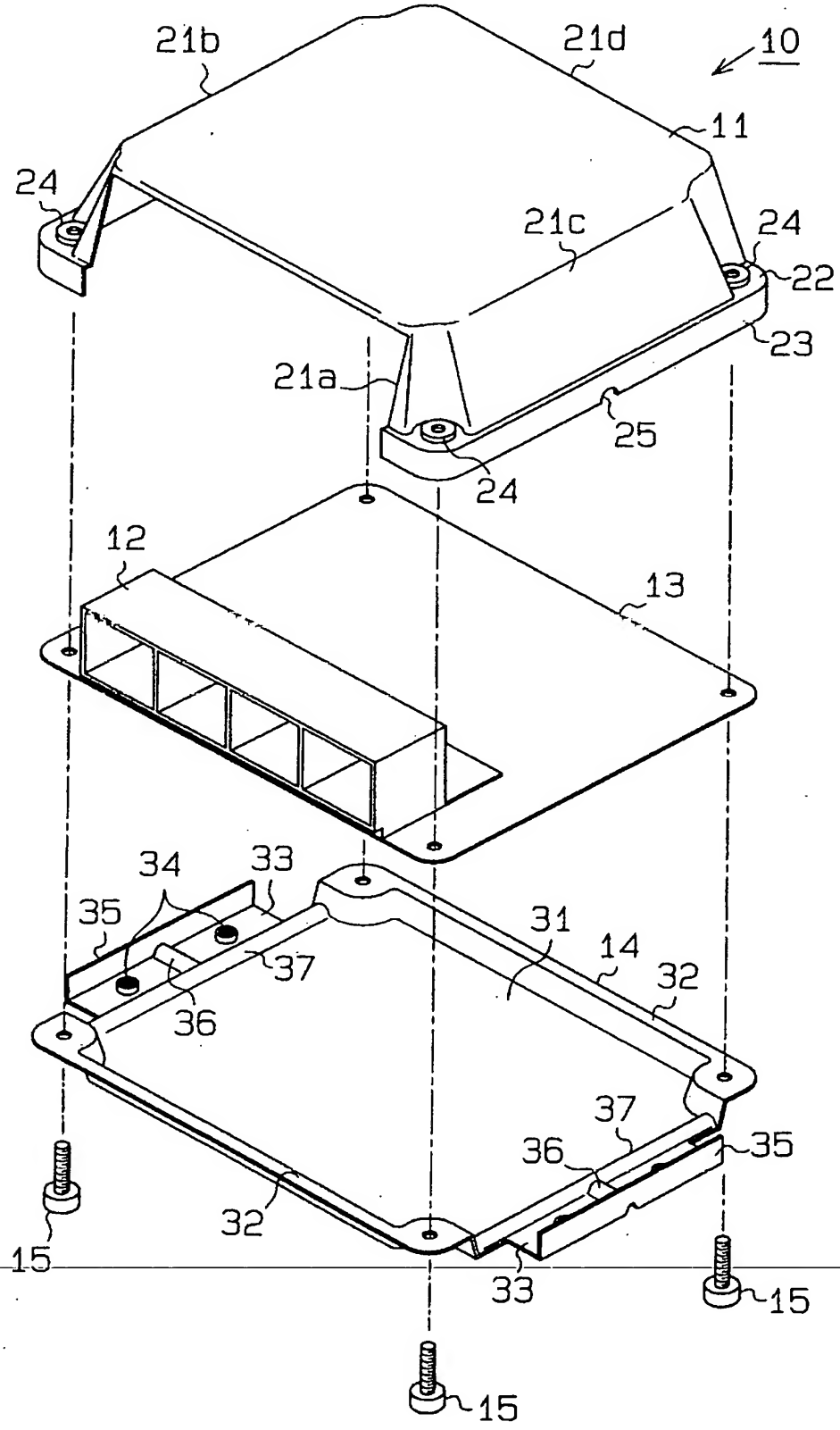
[Selected Drawing] Fig. 2

【書類名】　図面　[Name of Document]　Drawings

【図１】　[Fig. 1]



【図２】　[Fig. 2]


21b
21d
10
11
24
21c
24
22
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21a
25
24
12
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34
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31
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37
32
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36
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33
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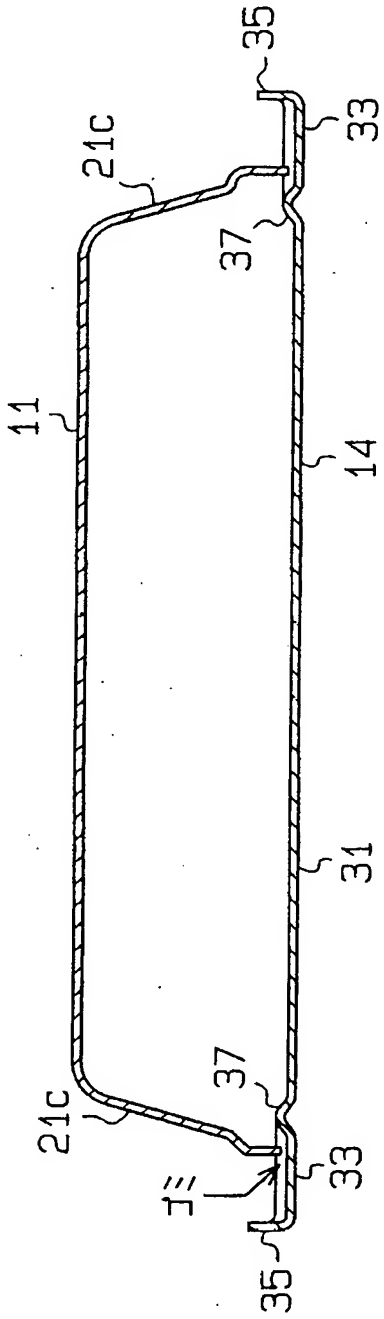
15
15

【図３】 [Fig. 3]



【図４】　[Fig. 4]